

CLAIMS:

What is claimed is:

- 1 1. A method in a data processing system for maintaining
2 a database of usage information of a plurality of
3 physical devices, said method comprising the steps of:
4 providing a virtualization system interposed between
5 a host computer system and a plurality of physical
6 devices, wherein said host computer system is capable of
7 accessing virtual interfaces and is incapable of directly
8 accessing any of said plurality of physical devices;
9 establishing a database within said virtualization
10 system for storing information; and
11 storing, within said database, information about
12 transactions processed by said virtualization system
13 utilizing said plurality of physical devices.
- 1 2. The method according to claim 1, further comprising
2 the step of accessing, utilizing said host computer
3 system, said database.
- 1 3. The method according to claim 2, further comprising
2 the step of utilizing said database by said host computer
3 system to analyze performance of said plurality of
4 physical devices.
- 1 4. The method according claim 1, further comprising the
2 steps of:
3 detecting an error in one of said plurality of
4 physical devices; and

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5 storing information about said error in said
6 database.

1 5. The method according to claim 1, further comprising
2 the step of storing, within said database, information
3 about a usage of each one of said plurality of storage
4 devices.

1 6. The method according to claim 1, further comprising
2 the step of for each one of said plurality of physical
3 devices, maintaining a separate history within said
4 database of usage of each one of said plurality of
5 storage devices.

1 7. The method according to claim 1, further comprising
2 the steps of:

3 detecting an error in one of said plurality of
4 physical devices occurring during processing of one of a
5 plurality of transactions;

6 identifying said one of said plurality of physical
7 devices having said error;

8 identifying said one of said plurality of
9 transactions associated with said error; and

10 storing information about said error including said
11 identification of said one of plurality of transactions
12 and said identification of said one of said plurality of
13 physical devices in said database.

1 8. The method according to claim 7, further comprising
2 the step of storing said information about said error in

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3 said database with an entry associated with said one of
4 said identified one of said plurality of physical
5 devices.

1 9. The method according to claim 1, further comprising
2 the steps of:

3 processing, within said virtualization system, a
4 transaction between said host computer system and a first
5 virtual interface by translating said first virtual
6 interface to one of said plurality of physical devices
7 associated with said first virtual interface; and
8 storing, in said database, information about said
9 transaction.

1 10. The method according to claim 9, further comprising
2 the steps of:

3 maintaining a separate history within said database
4 of usage of each one of said plurality of physical
5 devices; and
6 storing said information in a history associated
7 with said one of said plurality of physical devices.

1 11. The method according to claim 9, further comprising
2 the step of monitoring, utilizing said virtualization
3 system, said transaction.

1 12. The method according to claim 9, further comprising
2 the steps of:

3 collecting, utilizing said virtualization system, an
4 identification of said first virtual interface; and

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5 storing said identification of said first virtual
6 interface in said entry associated with said transaction.

1 13. The method according to claim 9, further comprising
2 the steps of:

3 collecting, utilizing said virtualization system, an
4 identification of said one of said plurality of physical
5 devices associated with said first virtual interface; and
6 storing said identification of said one of said
7 plurality of physical devices in said entry associated
8 with said transaction.

1 14. The method according to claim 9, further comprising
2 the steps of:

3 collecting, utilizing said virtualization system, an
4 identification of a physical device utilized during said
5 transaction; and

6 storing said identification of said physical device
7 in said entry associated with said transaction.

1 15. The method according to claim 14, wherein the step
2 of collecting an identification of a physical device
3 further comprises the step of collecting an
4 identification of a particular tape cartridge.

1 16. The method according to claim 14, wherein the step
2 of collecting an identification of a physical device
3 further comprises the step of collecting an
4 identification of a particular hub.

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1 17. The method according to claim 14, wherein the step
2 of collecting an identification of a physical device
3 further comprises the step of collecting an
4 identification of a particular switch.

1 18. The method according to claim 14, wherein the step
2 of collecting an identification of a physical device
3 further comprises the step of collecting an
4 identification of a particular tape drive.

1 19. The method according to claim 9, further comprising
2 the steps of:
3 collecting, utilizing said virtualization system,
4 information about a data transfer executed during said
5 transaction; and
6 storing said information about said data transfer in
7 said database.

1 20. The method according to claim 19, wherein the step
2 of collecting information about a data transfer further
3 comprises the step of collecting information about a date
4 of said data transfer.

1 21. The method according to claim 19, wherein the step
2 of collecting information about a data transfer further
3 comprises the step of collecting information about a time
4 of day of said data transfer.

1 22. The method according to claim 19, wherein the step
2 of collecting information about a data transfer further

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3 comprises the step of collecting information about a
4 duration of said data transfer.

1 23. The method according to claim 1, further comprising
2 the step of storing, within said database, information
3 about errors in said plurality of physical devices
4 occurring during said transactions.

1 24. The method according to claim 1, wherein said
2 virtual interfaces are virtual storage devices.

1 25. The method according to claim 1, wherein said
2 virtual interfaces are virtual libraries.

1 26. The method according to claim 1, wherein said
2 virtual interfaces are virtual volumes.

1 27. The method according to claim 1, wherein said
2 virtual interfaces are virtual drives.

1 28. The method according to claim 1, wherein said
2 virtual interfaces are virtual disk drives.

1 29. The method according to claim 1, wherein said
2 virtual interfaces are virtual tape drives.

1 30. The method according to claim 1, wherein said
2 virtual interfaces are a combination of different virtual
3 interfaces.

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1 31. The method according to claim 30, wherein said
2 virtual interfaces are virtual storage devices and
3 virtual libraries.

1 32. The method according to claim 1, wherein said
2 physical devices are physical storage devices.

1 33. The method according to claim 1, wherein said
2 physical devices are physical disk drives.

1 34. The method according to claim 1, wherein said
2 physical devices are physical tape drives.

1 35. A data processing system for maintaining a database
2 of usage information of a plurality of physical devices,
3 comprising:

4 means for providing a virtualization system
5 interposed between a host computer system and a plurality
6 of physical devices, wherein said host computer system is
7 capable of accessing virtual interfaces and is incapable
8 of directly accessing any of said plurality of physical
9 devices;

10 a database established within said virtualization
11 system for storing information; and

12 means for storing, within said database, information
13 about transactions processed by said virtualization
14 system utilizing said plurality of physical devices.

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1 36. The system according to claim 35, further comprising
2 means for accessing, utilizing said host computer system,
3 said database.

1 37. The system according to claim 36, further comprising
2 means for utilizing said database by said host computer
3 system to analyze performance of said plurality of
4 physical devices.

1 38. The system according claim 35, further comprising:
2 means for detecting an error in one of said
3 plurality of physical devices; and
4 means for storing information about said error in
5 said database.

1 39. The system according to claim 35, further comprising
2 means for storing, within said database, information
3 about a usage of each one of said plurality of storage
4 devices.

1 40. The system according to claim 35, further comprising
2 for each one of said plurality of physical devices, means
3 for maintaining a separate history within said database
4 of usage of each one of said plurality of storage
5 devices.

1 41. The system according to claim 35, further
2 comprising:

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3 means for detecting an error in one of said
4 plurality of physical devices occurring during processing
5 of one of a plurality of transactions;
6 means for identifying said one of said plurality of
7 physical devices having said error;
8 means for identifying said one of said plurality of
9 transactions associated with said error; and
10 means for storing information about said error
11 including said identification of said one of plurality of
12 transactions and said identification of said one of said
13 plurality of physical devices in said database.

1 42. The system according to claim 41, further comprising
2 means for storing said information about said error in
3 said database with an entry associated with said one of
4 said identified one of said plurality of physical
5 devices.

1 43. The system according to claim 35, further
2 comprising:

3 means for processing, within said virtualization
4 system, a transaction between said host computer system
5 and a first virtual interface by translating said first
6 virtual interface to one of said plurality of physical
7 devices associated with said first virtual interface; and
8 means for storing, in said database, information
9 about said transaction.

1 44. The system according to claim 43, further
2 comprising:

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3 means for maintaining a separate history within said
4 database of usage of each one of said plurality of
5 physical devices; and

6 means for storing said information in a history
7 associated with said one of said plurality of physical
8 devices.

1 45. The system according to claim 43, further comprising
2 means for monitoring, utilizing said virtualization
3 system, said transaction.

1 46. The system according to claim 43, further
2 comprising:

3 means for collecting, utilizing said virtualization
4 system, an identification of said first virtual
5 interface; and

6 means for storing said identification of said first
7 virtual interface in said entry associated with said
8 transaction.

1 47. The system according to claim 43, further
2 comprising:

3 means for collecting, utilizing said virtualization
4 system, an identification of said one of said plurality
5 of physical devices associated with said first virtual
6 interface; and

7 means for storing said identification of said one of
8 said plurality of physical devices in said entry
9 associated with said transaction.

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1 48. The system according to claim 43, further
2 comprising:
3 means for collecting, utilizing said virtualization
4 system, an identification of a physical device utilized
5 during said transaction; and
6 means for storing said identification of said
7 physical device in said entry associated with said
8 transaction.

1 49. The system according to claim 48, wherein said means
2 for collecting an identification of a physical device
3 further comprises means for collecting an identification
4 of a particular tape cartridge.

1 50. The system according to claim 48, wherein said means
2 for collecting an identification of a physical device
3 further comprises means for collecting an identification
4 of a particular hub.

1 51. The system according to claim 48, wherein said means
2 for collecting an identification of a physical device
3 further comprises means for collecting an identification
4 of a particular switch.

1 52. The system according to claim 48, wherein said means
2 for collecting an identification of a physical device
3 further comprises means for collecting an identification
4 of a particular tape drive.

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1 53. The system according to claim 43, further
2 comprising:
3 means for collecting, utilizing said virtualization
4 system, information about a data transfer executed during
5 said transaction; and
6 means for storing said information about said data
7 transfer in said database.

1 54. The system according to claim 53, wherein said means
2 for collecting information about a data transfer further
3 comprises means for collecting information about a date
4 of said data transfer.

1 55. The system according to claim 53, wherein said means
2 for collecting information about a data transfer further
3 comprises means for collecting information about a time
4 of day of said data transfer.

1 56. The system according to claim 53, wherein said means
2 for collecting information about a data transfer further
3 comprises means for collecting information about a
4 duration of said data transfer.

1 57. The system according to claim 35, further comprising
2 means for storing, within said database, information
3 about errors in said plurality of physical devices
4 occurring during said transactions.

1 58. The system according to claim 35, wherein said
2 virtual interfaces are virtual storage devices.

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1 59. The system according to claim 35, wherein said
2 virtual interfaces are virtual libraries.

1 60. The system according to claim 35, wherein said
2 virtual interfaces are virtual volumes.

1 61. The system according to claim 35, wherein said
2 virtual interfaces are virtual drives.

1 62. The system according to claim 35, wherein said
2 virtual interfaces are virtual disk drives.

1 63. The system according to claim 35, wherein said
2 virtual interfaces are virtual tape drives.

1 64. The system according to claim 35, wherein said
2 virtual interfaces are a combination of different virtual
3 interfaces.

1 65. The system according to claim 64, wherein said
2 virtual interfaces are virtual storage devices and
3 virtual libraries.

1 66. The system according to claim 35, wherein said
2 physical devices are physical storage devices.

1 67. The system according to claim 35, wherein said
2 physical devices are physical disk drives.

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1 68. The system according to claim 35, wherein said
2 physical devices are physical tape drives.

1 69. A computer program product for maintaining a
2 database of usage information of a plurality of physical
3 devices, said product comprising:
4 instruction means for providing a virtualization
5 system interposed between a host computer system and a
6 plurality of physical devices, wherein said host computer
7 system is capable of accessing virtual interfaces and is
8 incapable of directly accessing any of said plurality of
9 physical devices;

10 instruction means for establishing a database within
11 said virtualization system for storing information; and

12 instruction means for storing, within said database,
13 information about transactions processed by said
14 virtualization system utilizing said plurality of
15 physical devices.

1 70. The product according to claim 69, further
2 comprising instruction means for accessing, utilizing
3 said host computer system, said database.

1 71. The product according to claim 70, further
2 comprising instruction means for utilizing said database
3 by said host computer system to analyze performance of
4 said plurality of physical devices.

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1 72. The product according claim 69, further comprising:
2 instruction means for detecting an error in one of
3 said plurality of physical devices; and
4 instruction means for storing information about said
5 error in said database.

1 73. The product according to claim 69, further
2 comprising instruction means for storing, within said
3 database, information about a usage of each one of said
4 plurality of storage devices.

1 74. The product according to claim 69, further
2 comprising for each one of said plurality of physical
3 devices, instruction means for maintaining a separate
4 history within said database of usage of each one of said
5 plurality of storage devices.

1 75. The product according to claim 69, further
2 comprising:
3 instruction means for detecting an error in one of
4 said plurality of physical devices occurring during
5 processing of one of a plurality of transactions;
6 instruction means for identifying said one of said
7 plurality of physical devices having said error;
8 instruction means for identifying said one of said
9 plurality of transactions associated with said error; and
10 instruction means for storing information about said
11 error including said identification of said one of
12 plurality of transactions and said identification of said

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13 one of said plurality of physical devices in said
14 database.

1 76. The product according to claim 75, further
2 comprising instruction means for storing said information
3 about said error in said database with an entry
4 associated with said one of said identified one of said
5 plurality of physical devices.

1 77. The product according to claim 69, further
2 comprising:
3 instruction means for processing, within said
4 virtualization system, a transaction between said host
5 computer system and a first virtual interface by
6 translating said first virtual interface to one of said
7 plurality of physical devices associated with said first
8 virtual interface; and
9 instruction means for storing, in said database,
10 information about said transaction.

1 78. The product according to claim 77, further
2 comprising:
3 instruction means for maintaining a separate history
4 within said database of usage of each one of said
5 plurality of physical devices; and
6 instruction means for storing said information in a
7 history associated with said one of said plurality of
8 physical devices.

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1 79. The product according to claim 77, further
2 comprising instruction means for monitoring, utilizing
3 said virtualization system, said transaction.

1 80. The product according to claim 77, further
2 comprising:
3 instruction means for collecting, utilizing said
4 virtualization system, an identification of said first
5 virtual interface; and
6 instruction means for storing said identification of
7 said first virtual interface in said entry associated
8 with said transaction.

1 81. The product according to claim 77, further
2 comprising:
3 instruction means for collecting, utilizing said
4 virtualization system, an identification of said one of
5 said plurality of physical devices associated with said
6 first virtual interface; and
7 instruction means for storing said identification of
8 said one of said plurality of physical devices in said
9 entry associated with said transaction.

1 82. The product according to claim 77, further
2 comprising:
3 instruction means for collecting, utilizing said
4 virtualization system, an identification of a physical
5 device utilized during said transaction; and

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6 instruction means for storing said identification of
7 said physical device in said entry associated with said
8 transaction.

1 83. The product according to claim 82, wherein said
2 instruction means for collecting an identification of a
3 physical device further comprises instruction means for
4 collecting an identification of a particular tape
5 cartridge.

1 84. The product according to claim 82, wherein said
2 instruction means for collecting an identification of a
3 physical device further comprises instruction means for
4 collecting an identification of a particular hub.

1 85. The product according to claim 82, wherein said
2 instruction means for collecting an identification of a
3 physical device further comprises instruction means for
4 collecting an identification of a particular switch.

1 86. The product according to claim 82, wherein said
2 instruction means for collecting an identification of a
3 physical device further comprises instruction means for
4 collecting an identification of a particular tape drive.

1 87. The system according to claim 77, further
2 comprising:

3 instruction means for collecting, utilizing said
4 virtualization system, information about a data transfer
5 executed during said transaction; and

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6 instruction means for storing said information about
7 said data transfer in said database.

1 88. The product according to claim 77, wherein said
2 instruction means for collecting information about a data
3 transfer further comprises instruction means for
4 collecting information about a date of said data
5 transfer.

1 89. The product according to claim 77, wherein said
2 instruction means for collecting information about a data
3 transfer further comprises instruction means for
4 collecting information about a time of day of said data
5 transfer.

1 90. The product according to claim 77, wherein said
2 instruction means for collecting information about a data
3 transfer further comprises instruction means for
4 collecting information about a duration of said data
5 transfer.

1 91. The product according to claim 69, further
2 comprising instruction means for storing, within said
3 database, information about errors in said plurality of
4 physical devices occurring during said transactions.

1 92. The product according to claim 69, wherein said
2 virtual interfaces are virtual storage devices.

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- 1 93. The product according to claim 69, wherein said
2 virtual interfaces are virtual libraries.
- 1 94. The product according to claim 69, wherein said
2 virtual interfaces are virtual volumes.
- 1 95. The product according to claim 69, wherein said
2 virtual interfaces are virtual drives.
- 1 96. The product according to claim 69, wherein said
2 virtual interfaces are virtual disk drives.
- 1 97. The product according to claim 69, wherein said
2 virtual interfaces are virtual tape drives.
- 1 98. The product according to claim 69, wherein said
2 virtual interfaces are a combination of different virtual
3 interfaces.
- 1 99. The product according to claim 98, wherein said
2 virtual interfaces are virtual storage devices and
3 virtual libraries.
- 1 100. The product according to claim 69, wherein said
2 physical devices are physical storage devices.
- 1 101. The product according to claim 69, wherein said
2 physical devices are physical disk drives.

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- 1 102. The product according to claim 69, wherein said
- 2 physical devices are physical tape drives.

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